

Application No. 10/523,692
Amendment dated January 3, 2007
Reply to Office Action of October 5, 2006

Docket No. 2830-0188PUS1
Art Unit: 3747
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AMENDMENTS TO THE DRAWINGS

Five Sheets of Replacement Drawings (FIGS. 2, 12, 14, 15, and 21) are attached to this Amendment.

REMARKS

The Applicant thanks the Examiner for the thorough consideration given the present application. Claims 1-20 are pending. Claims 1 is amended, and claims 2-20 are added. Claims 1 and 11 are independent. The Examiner is respectfully requested to reconsider the rejections in view of the amendments and remarks set forth herein.

Amendments to the Drawings

Five Sheets of Replacement Drawings (FIGS, 2, 12, 14, 15, and 21) are attached to this Amendment. The changes include:

Fig. 2: reference numeral 28₂ is changed to 28₁.

Fig. 12: the state of first actuator 20₁ on the left side is changed to be the same as of second actuator 20₁ on the right side. Reference numeral 33 is changed to 23.

Fig. 14: the sectional line 21-21 for Fig. 21 is inserted.

Fig. 15: the sectional line 21-21 is deleted.

Fig. 21: reference numerals 31₂, 32_{2b} are changed to 31₁, 32_{1b}.

No New matter has been added to the drawings.

Claim for Priority

It is gratefully appreciated that the Examiner has recognized the Applicant's claim for foreign priority.

Acknowledgement of Information Disclosure Statement

It is gratefully appreciated that the Examiner has acknowledged the Information Disclosure Statement filed on February 3, 2005.

Revised Abstract of the Disclosure

The Abstract of the Disclosure has been revised to comply with the rules of U.S. practice.

Substitute Specification

In accordance with MPEP § 608.01(q), Applicant herewith submits a substitute specification in the above-identified application. Also included is a marked-up copy of the original specification which shows the portions of the original specification which are being added and deleted. Applicant respectfully submits that the substitute specification includes no new matter and that the substitute specification includes the same changes as are indicated in the marked-up copy of the original specification showing additions and deletions.

Because the number of amendments which are being made to the original specification would render it difficult to consider the case, or to arrange the papers for printing or copying, the Applicant has voluntarily submitted this substitute specification. Accordingly, the Applicant respectfully requests that the substitute specification be entered into the application.

Rejection Under 35 U.S.C. § 102(b)

Claim 1 stands rejected under 35 U.S.C. § 102(b) as being anticipated by Hasegawa (U.S. 4,864,977). This rejection is respectfully traversed.

Arguments Regarding Amended Independent Claim 1

While not conceding the appropriateness of the Examiner's rejection, but merely to advance prosecution of the present application, independent claim 1 has been amended herein to recite a combination of elements directed to an internal combustion engine variable compression ratio system including *inter alia* the following features (1) to (4):

- (1) at least two sets of raising means disposed in line in the axial direction between an upper face of the piston inner and a lower face of the piston outer opposed to the upper face of the piston inner, each set of raising means comprising a movable raising member,
- (2) the movable raising members being individually capable of pivoting in a peripheral direction between a non-raised position (A) and a raised position (B) around the axis of the piston inner and outer,
- (3) the piston outer being held at the high compression ratio position (H) when two of the movable raising members are pivoted to the raised position (B), and
- (4) each of the raising means further comprising a member opposed to the respective movable raising member and capable of changing a position in abutment against the movable raising member in the axial direction of the piston inner and piston outer.

The Applicant respectfully submits that the combination of elements as set forth in independent claim 1 is not disclosed or made obvious by the prior art of record, including Hasegawa.

In justifying the rejection of claim 1 based on Hasegawa, the Examiner calls elements 5, 6 of Hasegawa as “raising means” and elements 4, 3 as “movable raising member”. However, elements 5, 6 of Hasegawa are hydraulic chambers, and upon selective supply of hydraulic pressure into one of the chambers 5, 6 the piston 2 can alternatively assume a higher compression ratio position shown on the left half side of Fig. 1 or a lower compression ratio position on the right half side of Fig. 1. Chamber 5 is defined between the lower face of piston head 3 (as piston outer) and upper face of piston base 4 (as piston inner) while the other chamber 6 is between the lower face of piston base 4 and opposed upper face of piston head 3. This structure of Hasegawa is thus totally different from the arrangement (1) of the invention noted above.

Apparently, in Hasegawa, when the hydraulic pressure is supplied into one of chambers 5 and 6, the piston head 3 moves axially relative to the piston base 4. Merely the expansion and contraction of each chamber 5, 6 are repeated. Pivoting of the “raising means 5, 6” in a peripheral direction between a non-raised position and a raised position around the axis of the piston inner and outer 3, 4 as required by the above feature (2) cannot be provided in the arrangement of Hasegawa.

The above feature (3) requires that the piston outer (5b) be held at the high compression ratio position (H) when two of the movable raising members (14₁, 14₂) are pivoted to the raised position (B). As discussed above, in Hasegawa, at the higher compression ratio position (on the left half side of Fig. 1), the hydraulic pressure is supplied only to the chamber 5. No pivoting of two movable raising members has been contemplated in this prior art.

Regarding the feature (4), the invention is characterized by the position of axial abutment between a member (13₁, 13₂) and opposed movable raising member (14₁, 14₂) being changed. As discussed above, Hasegawa relates to changing the axial position of two members 3 and 4 by controlling supply of hydraulic pressure into chambers 5, and 6.

In addition, concerning the medium compression ratio position (M) set forth in independent claim 1, the variable compression system taught by Hasagawa is basically different, and thus does not teach or suggest the medium compression ratio position (M) as presently claimed.

At least for the reasons described above, the Applicant respectfully submits that the combination of elements as set forth in independent claim 1 is not disclosed or made obvious by the prior art of record, including Hasegawa. Accordingly, reconsideration and withdrawal of this rejection are respectfully requested.

Arguments Regarding Added Independent Claim 11

In addition, independent claim 11 has been added herein to recite a combination of elements directed to an internal combustion engine variable compression ratio system including *inter alia* the following feature (2):

(2) the movable raising members being individually capable of pivoting in a peripheral direction between a non-raised position (A) and a raised position (B) around the axis of the piston inner and outer.

Support for the features set forth in independent claim 11 can be seen in the application as originally filed, for example, see FIGS. 2, 9, and 12. See also the disclosure on page 5, line 19 through page 8, line 8 of the specification as originally filed.

The Applicant respectfully submits that the combination of elements as set forth in independent claim 11 is not disclosed or made obvious by the prior art of record, including Hasegawa.

As argued above, Hasagawa merely discloses hydraulic chambers 5, 6, and certainly does not teach the movable raising members being individually capable of pivoting in a peripheral direction between a non-raised position (A) and a raised position (B) around the axis of the piston inner and outer, as set forth in added independent claim 11.

In addition, concerning the medium compression ratio position (M) set forth in independent claim 11, the variable compression system taught by Hasagawa is basically

different, and thus does not teach or suggest the medium compression ratio position (M) as presently claimed.

At least for the reasons described above, the Applicant respectfully submits that the combination of elements as set forth in independent claim 11 is not disclosed or made obvious by the prior art of record, including Hasegawa. Accordingly, reconsideration and withdrawal of this rejection are respectfully requested.

Dependent Claims

Each of dependent claims 2-10 and 12-20 is in condition for allowance due to their dependency from allowable independent claims, as well as for the additional novel limitations set forth therein.

Accordingly, reconsideration and withdrawal of the rejection under 35 U.S.C. § 102(b) are respectfully requested.

All claims are now in condition for allowance.

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CONCLUSION

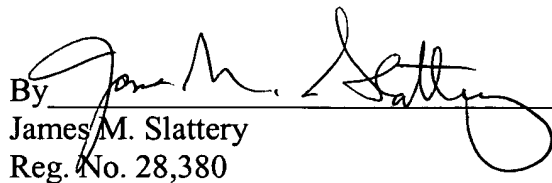
All of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. It is believed that a full and complete response has been made to the outstanding Office Action, and that the present application is in condition for allowance.

If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, he is invited to telephone Carl T. Thomsen (Reg. No. 50,786) at (703) 205-4030 (Direct Line).

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17, particularly extension of time fees.

Respectfully submitted,
BIRCH, STEWART, KOLASCH & BIRCH, LLP

Dated: January 3, 2007

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Attachments: Substitute Specification
Revised Abstract
Five sheets of Replacement Drawings (FIGS. 2, 12, 14, 15, and 21)

Abstract of the Disclosure (Revised)

An internal combustion engine variable compression ratio system includes a piston inner, a piston outer that, while being fitted around the outer periphery of the piston inner, so it slides only in the axial direction, is capable of moving among low (L), high (H), and medium (M) compression ratio positions, and two sets of raising means disposed in line in the axial direction between the piston inner and outer. Each set of raising means includes a movable raising member, which can pivot individually between a non-raised position (A) and a raised position (B) around the axis of the piston inner and outer. It is thus possible to provide an internal combustion engine variable compression ratio system that enables the compression ratio to be appropriately switched between at least three stages, that is, between low, medium and high compression ratios, without rotating the piston outer.